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An Improved Physical User Interface

Field of the Invention

The invention pertains to computer interfaces and more particularly to a physical interface between a user and a computer.

Background of the Invention

A typical graphical interface (GUI) is not suitable for certain users including young child and some physically or mentally challenged adults. The amount of information on the screen, its complexity, and the mastery of graphic symbols required to use a typical graphical interface is often beyond the grasp of these users. Additionally, a typical GUI often requires fine motor skills and good eyesight to launch, position, re-size and close application windows. This can be a source of frustration and strain for users. When many application windows are open, a GUI may require a user to close (or minimise) one or more windows in order to see the icons that are used to launch other applications.

Objects and Summary of the Invention

The present invention seeks to provide an interface device to a computer that is appropriate for children, the disabled and/or inexperienced or non-expert personal computer (PC) users.

The present invention also seeks to provide a physical interface to a computer.

The invention is aimed at new, challenged, or average users, and children. It need not be suitable for experienced PC users.

Accordingly the invention provides a device having a case or electronic substrate with a flat work surface on which is located one or more sensors. The work surface is subdivided into regions. The device is connectable as a peripheral device to a computer. One or more uniquely identifiable counters are provided. A counter fits within a region on the work surface (which may or may not be visually defined) and each counter is detectable by a sensor embedded in the region in a way that distinguishes it from other counters on the work surface. Collectively, the sensors can determine which region a given counter is in.

In some embodiments, a control program provides commands, based on sensor data. Examples of commands are to maximise, minimise or otherwise re-size an application window related to a counter.

In a further preferred embodiment, the sensor or sensors also detect an orientation of a counter and the signal processor uses the orientation as well as the location and identity data to generate the second signal.

In a further preferred embodiment, the counter contains data storage capacity (memory), and is in communication in a bi-directional manner with the control program. The memory may be pre-loaded ex-factory. If pre-loaded, the data may be deleted once read by the sensors and the control program, or the data may be permanent and non-erasable. Further, data may be downloaded from the PC to the counter. The downloaded data may be permanent, transient (present until over-written or erased), or ephemeral (deleted the next time the counter data is read by the PC). A counter may be

pre-set at the factory to launch a given application, for example when packaged with a game. A combination of permanent, transient, and ephemeral data may co-exist in the memory of a single counter.

Counters may be transferable from a device connected to a PC to a similar device connected to another PC. For example, the association recorded by the device on a first PC using one application could, if the same application is installed on a second PC, allow the user to continue to use the application without a new association having to be made. Furthermore, the data recorded at one PC could be used on another PC or with another application on the same or other PC.

The types of data stored on the counters include, but are not limited to, a) security keys or passwords; b) settings, properties, and data associated with a specific application; c) player profiles and personal avatars for games, instant messaging, etc.; and d) applets or other applications.

Brief Description of the Drawing Figures

Figure 1 is a perspective view of an example of a physical interface according to the teachings of the present invention.

Figures 2 (a) - (c) are top plan views of embodiments of counters.

Figure 2 (d) is a side elevation of a counter.

Figure 3 depicts perspective views of alternate counters.

Figure 4 is an alternate surface arrangement of a physical user interface.

Best Mode and other Embodiments of the Invention

As shown in Figure 1, the invention 10 comprises a case 11 having a flat, smooth, impermeable top surface 12. The top surface is subdivided into regions 13. In this example, regions 13 are arranged as a matrix of rows and columns. There is provided a number of counters 14 which can be placed on the surface. A counter 14 fits within a region 13.

An electronic substrate or array of sensors below the work surface (not shown) consists of a mechanism 11 capable of detecting the row and column position of each of the counters 14. Each counter is uniquely identifiable by the sensors in the sense that each counter can be distinguished from every other counter in the set of counters. For this purpose, one can use magnetic, optical, Hall effect, capacitance, electro-optical (infrared), radio frequency identification (RFID), or other technologies which provide the required interaction between counter 14 and sensor - for example, a unique combination of magnets on a lower portion of each counter. The sensor or array or sensors repeatedly scan(s) the surface 11 and if any counter has moved, if a new counter is placed on the work surface, or if a counter is removed from the work surface, the device reports the positions of all counters. When RFID technology is used, each counter 14 is provided with its own RFID chip (or chips) and the substrate contains a sensing antenna.

The device 10, is connected to a computer 25, via a data path 27. The data path may be a USB cable, wireless communication connection, or other bi-directional technology. The data path is connected to a control program which communicates with application programs running on the computer 25.

The device may be run in series with a USB mouse or other pointing device (between the pointing device and the computer) and may have a spare USB ~~port or~~ port or similar port 15 for this purpose. It may also be run as a

stand alone device with an integrated touchpad/trackpoint or other pointing device 16. Its presence will have no effect on the operation of the mouse or other pointing device.

The control software on the ~~PC 25~~PC 25 will allow the user to assign (and re-assign) to each counter an association with an application on the PC 25. For example, counter 17 might be associated with a browser, counter 18 with an email client, and counter 19 with a word processing application. The control program communicates with application programs, transfers any data from the relevant counters on the device surface and may write to them as well (either directly from its own interface, or as a conduit on behalf of an associated application program). The control program also communicates with the operating system to start and stop application programs, to layer open windows and to re-size windows.

A counter 17 may have data storage capacity or memory in the form of flash memory or other read/write (or read-only technology). The surface sensors may interface with magnetic, infrared, RFID, or other bi-directional signal technology, so that the data in the counter may be read, written, updated, or erased. Thus when a counter 17 with memory is placed on the surface, the region 13 where the counter is located is identified and any data in the counter's memory is transferred to the connected computer 25 via the data path 27. Data on any counter may be read, written, updated, or deleted by the control program independently.

Data stored in a counter's memory may be permanent, transient, or ephemeral, or any combination of these. Permanent data may be recorded during or after manufacture, or on first use, and remains without change. Transient data may be read, written, updated, or deleted, for example, by an associated application program. Ephemeral data is deleted once read. A counter may have a combination of these. For example, the identity of the associated application may be permanent data so that the counter is always

used with and identifies the same program. User preferences may be transient data so that they remain constant until changed by the user. Temporary application state or status data may be ephemeral.

When a new counter (previously unused) is placed on a region 13, the control software may launch an associated application automatically if not already running or may prompt the user to associate the counter with a default or selected application. Any data on the counter is then read and transferred to or used with the associated or selected application.

Once a counter is used, the consequence is like a mouse click on a desktop icon. However, once an application is launched, previously recorded application data on the counter may be transferred to the application without user interaction.

When a counter is removed from the surface (either lifted off completely or slid to a non-active zone outside the matrix of regions) and has not been replaced within a designated time, the associated application will close automatically. While the counter is located on the surface, the application may update data on the counter according to the design of the application and the interactions with the user. Transient data may be updated and ephemeral data erased once read. As the counter may be moved or removed by the user at any time, the application is designed so that transient data is updated in a timely manner.

Moving a counter on a surface of the type exemplified in Figure 1 has the following effects: The horizontal axis (or row position) represents (optionally) the side to side position of the application window on the PC's GUI desktop. The vertical axis (or column position) represents a) the size of the application window, for example, as a percentage of its maximum size; and b) the relative positions (layering) of all open windows. The application associated with the counter highest on the vertical axis will be on top of all

other open applications (except and optionally those programmed to be 'always on top'). Where two or more counters occupy the same level on the vertical axis, the relative positions (layering) of their associated application programs will preferably be determined by the order in which each counter was placed in position – such that the application program associated with the most recently moved counter will be on top.

If the mouse (or other pointing device) has been used to re-arrange the desktop, any movement of any counter will re-set the desktop to the layout described by the positions of the counters.

As shown in Figure 1, a counter 14 may have a base 20 which provides a stable foundation as well as a physical platform for identification hardware such as magnets, bar codes, RFID chips etc. In this example, a stalk 21 separates a head 22 from the base 20. The head makes the counter 14 easy to handle and provides a top surface which can be used to identify the counter.

As shown in Figure 2, the top surface 23 of a counter may support a miniature display device 24 capable of displaying text or images which identify the counter and its associated application. The surface 23 may alternatively be used to put an identifying label 25 on. The top surface 23 may also have a fixture 26 for receiving user selected three dimensional indicia 27 which cooperate with the surface 23 or fixture 26 and which identify the counter and its associated application.

A shown in Figure 3, a counter may be a cylinder or disk 30 , cube 31, tetrahedron 32 or other three dimensional solid. Solids of this type have a discrete number of stable rest positions associated with its faces. E.g. the cube has six, the tetrahedron has 4 and the cylinder has two.

In a first preferred embodiment a counter will only have one identity, irrespective of which face is in contact with the work surface (or because the counters have a defined 'top' and 'bottom' and cannot be rotated)..

In a second preferred embodiment, the unique identification of a counter will vary depending upon which of its faces is in contact with the work surface. Accordingly, in this implementation, the identity of the counter will include two notional fields – a primary ordinal which will be associated with a single application on the user's PC (as above) and a second ordinal (numbered from 1 to n, where n is the number of significant faces on the solid shape). When the counter is flipped from one face to another, there will be a corresponding action within the associated application. In one example, if the application is a word processor, flipping a cylinder 30 from one flat face to the other causes the associated programme to step or cycle through all open word processing documents. In this case flipping the counter has the same effect as pressing Control F6 on the keyboard. Other actions are possible.

As shown in Figure 4, a surface 11 need not be square or rectangular. A preferred embodiment is a triangular surface 40 subdivided or tessellated into triangular or hexagonal regions 41 is well suited to the invention because while still having rows 42 for indication of horizontal position and relative GUI window size, there is only one location (e.g. 43) for a counter's associated program in the GUI to be at full screen and on top of all other open applications.

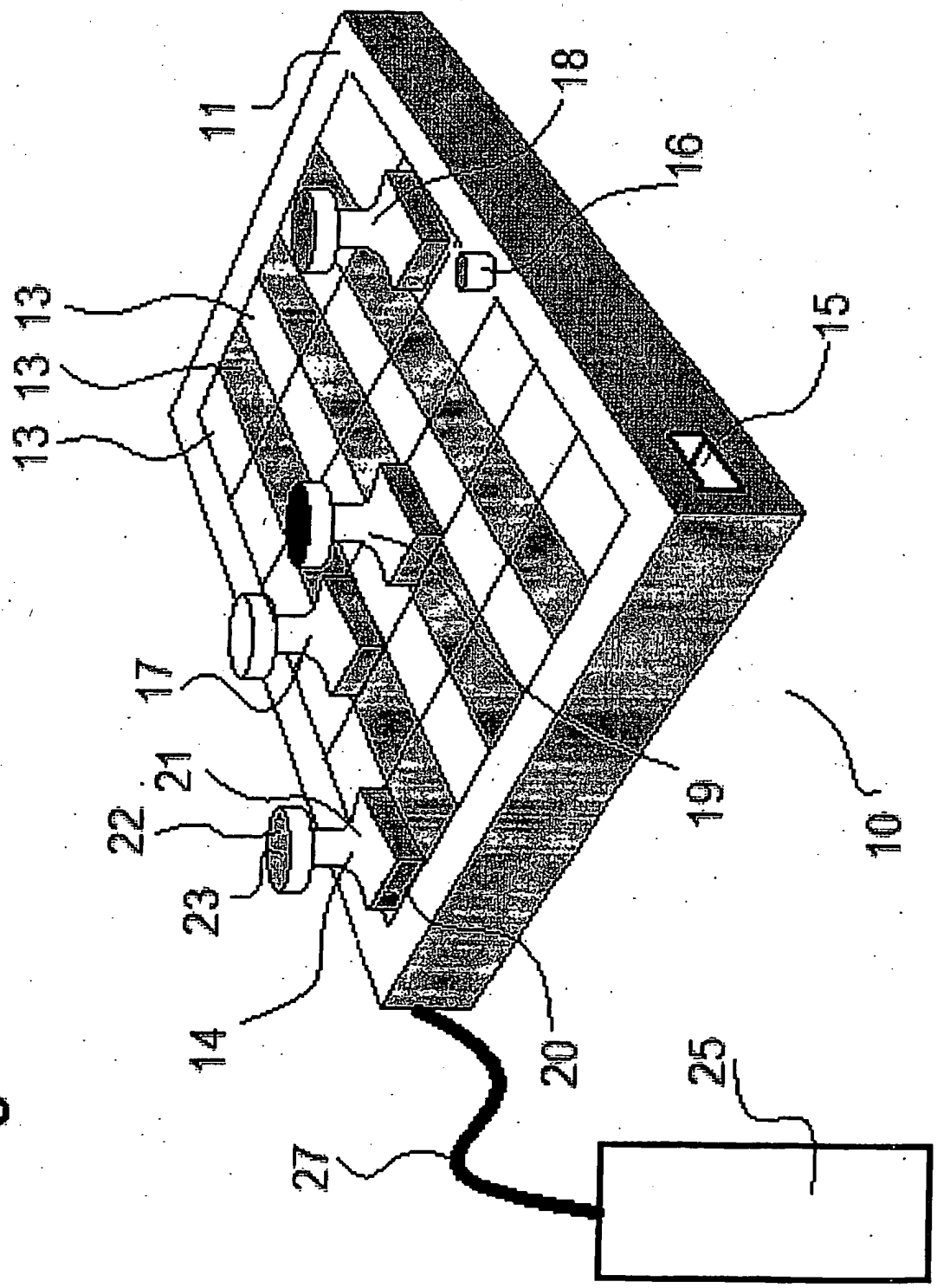
Irrespective of the shape of the work surface, the bottom row can indicate launched applications running minimised. So too, the work surface can be embedded in some larger surface (and would be designated by a graphic design), allowing the creation of 'inactive areas' (places where there are no sensors) outside the work surface. Counters could then be slid to these areas to terminate running applications and for storage.

The counters may be in a portable form. One example is a counter in the form of a key-ring. Another example is a player token included in a game, or provided or purchased separately from the game. In these examples, the portable counter could represent an avatar in an associated application game that is updated during play. In another example, when a counter is removed, it contains status information so that the game can be continued at a later time.

In another example, a security key is stored on a counter. An associated application is protected by a password, so that the application will not run or will not continue until the user places the counter on the surface and the password entered by the user agrees with or combines with the security key so as to indicate that the user is verified.

While the invention has been described with reference to particular details, these should be understood as having been provided as examples and not as limitations to the scope or spirit of the invention.

Fig. 1



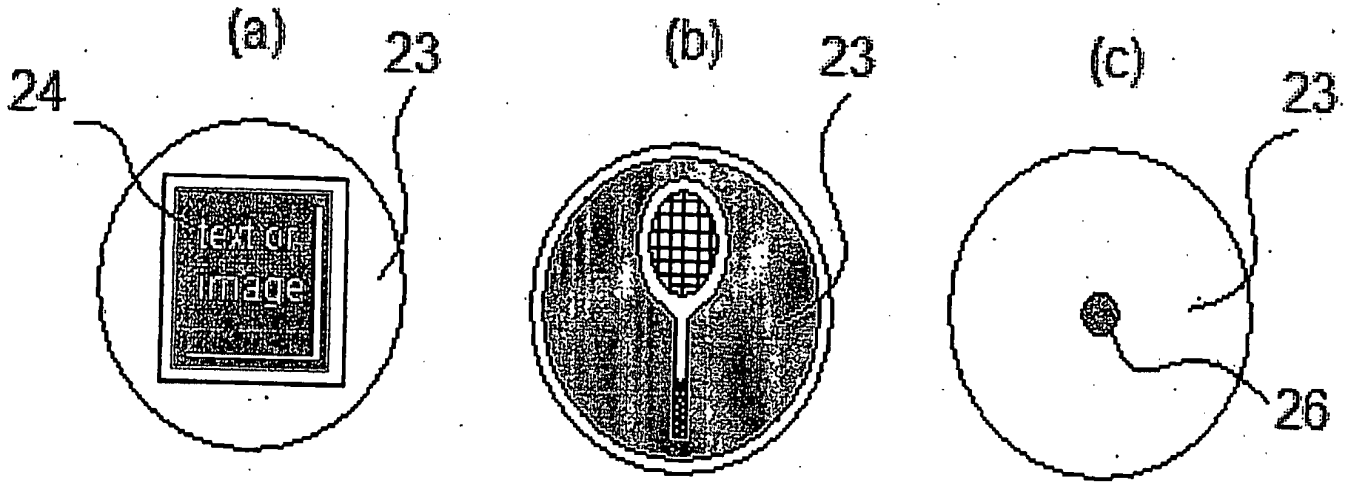
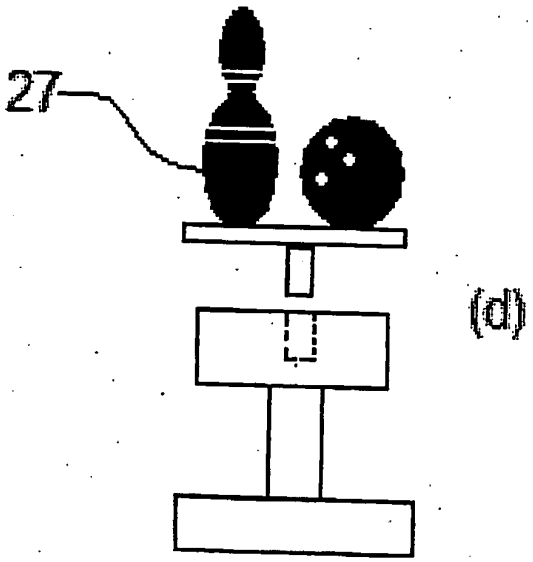


Fig. 2



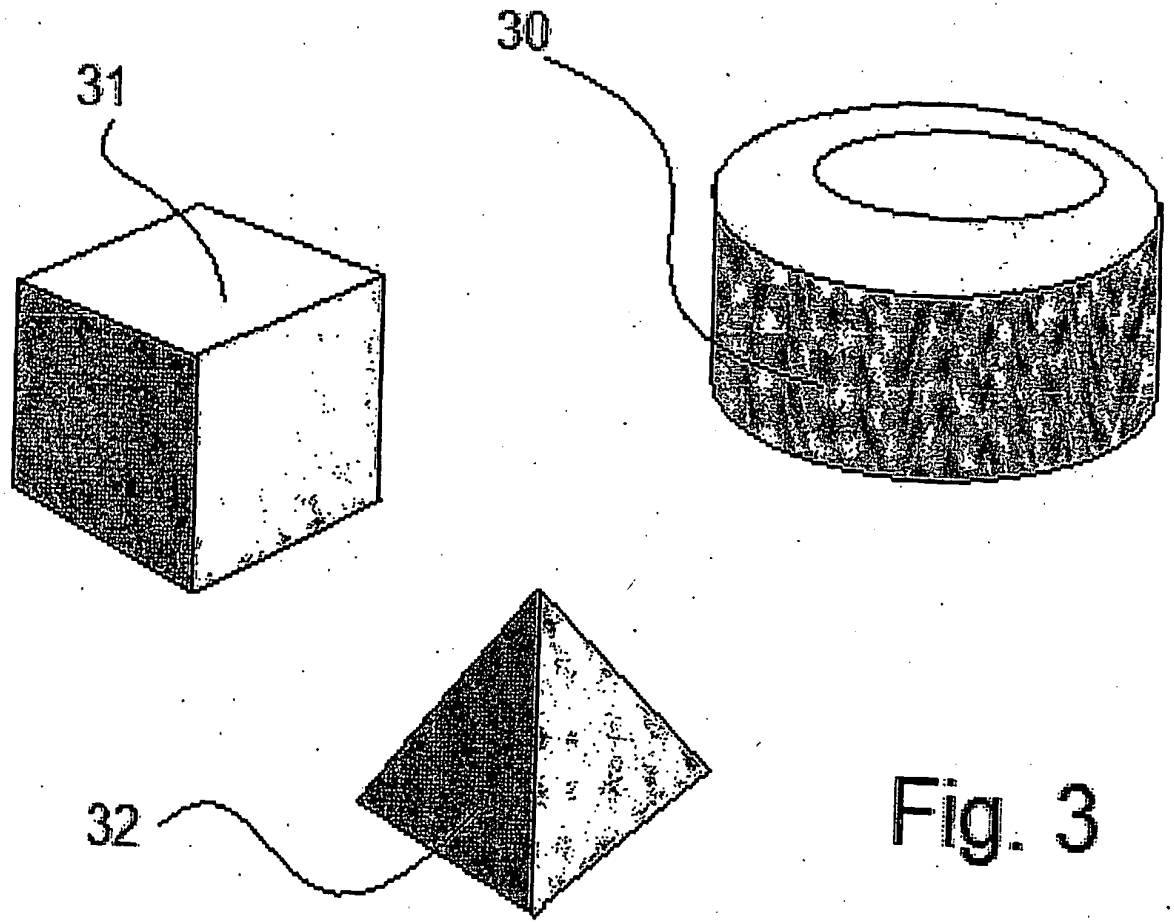


Fig. 3

Fig. 4